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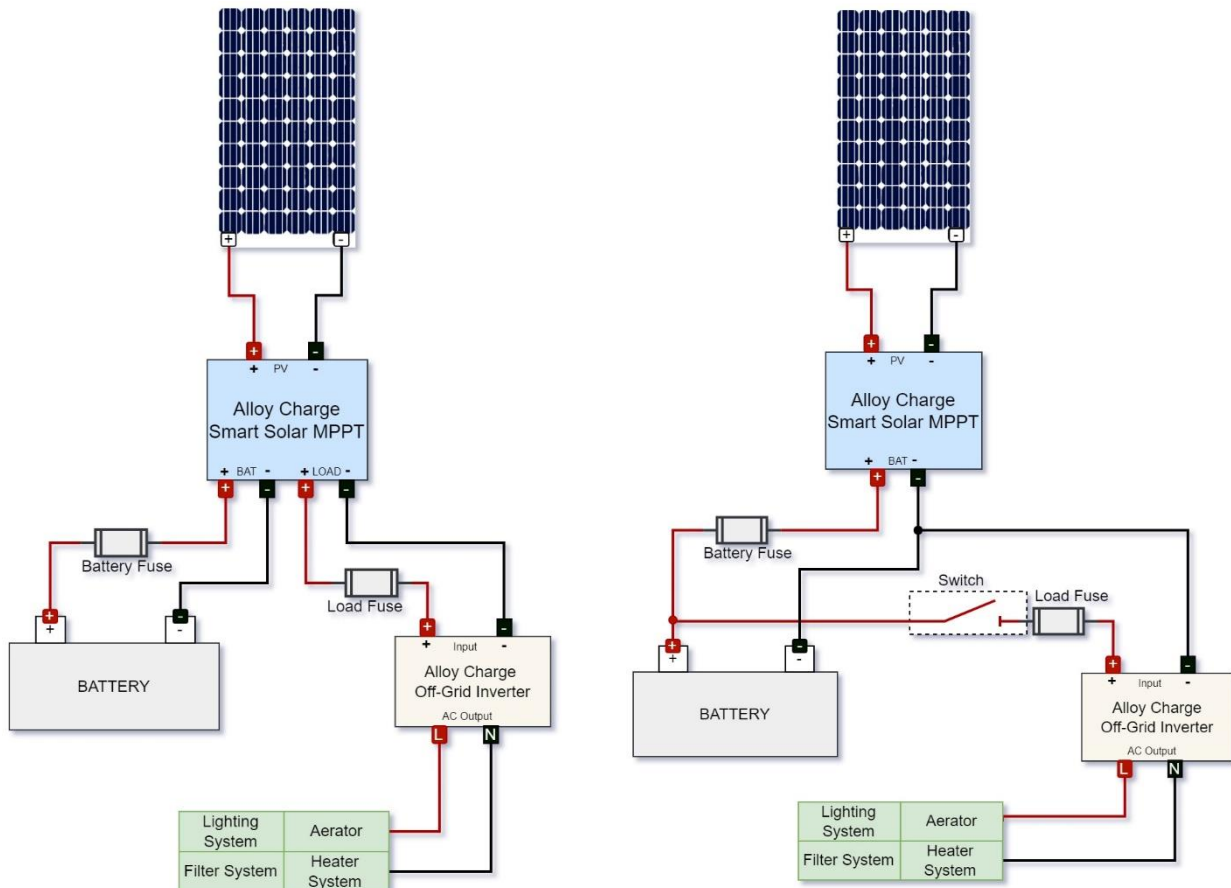
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Harnessing Solar Energy for Your Fish Pond

Introduction:

Solar energy is a remarkable resource that allows us to tap into the sun's abundant power. By harnessing sunlight through solar panels, we can generate electricity in an eco-friendly and sustainable manner. This document describes an easy solution for implementing a fish aqua system from solar power using Alloy Charge Smart Solar MPPT Charge Controller. Our smart solar mppt charge controller intelligently optimizes solar panel performance, ensuring efficient energy conversion. By tracking the maximum power point, it extracts every available watt from the panels. In the following sections, we will explore the essential components, their functions, and the overall system design for an affordable fish pond setup.

Block Diagram:



Method 1 of connecting load

Method 2 of connecting load

Description:

When creating a solar-powered fish pond, consider the following components and guidelines:

1. Equipment Components:
 - The energy usage in a fish tank primarily comes from various equipment components, including lighting systems, heaters, filters, air pumps, water pumps, and other accessories.
2. Solar Panel Connection:
 - Connect the solar panel directly to the Alloy Charge Smart Solar MPPT Charge Controller.
 - The charge controller intelligently manages incoming solar power, optimizing battery charging efficiency regardless of sunlight conditions.
 - Connect the battery to the designated terminals on the charge controller.
3. Load Connection Options:
 - Connect the load in one of two ways:
 - Load Terminal: Connect the load directly to the load terminal on the Alloy Charge Smart Solar MPPT Charge Controller.
 - Battery: Alternatively, connect the load directly to the battery.
 - For loads with high inrush current, the second option is recommended.
4. AC Loads:
 - If you have AC loads, consider using the Alloy Charge Off-Grid Inverter.
5. Protection Measures:
 - Provide individual fuses for the battery and load.
 - Remember that the load should only be used while the battery is connected to the Alloy Charge Smart Solar MPPT Charge Controller.

By following these steps, you'll create a reliable and efficient solar-powered fish pond for your aquatic companions.

Design Example:

Solar Powered Fish Aquarium/Pond

Following section shows how to design the PV system for your fish pond.

Load Calculation:

Let us assume,

For a fish pond, following are the common loads.

1. Lighting systems
2. Aerator
3. Filter system
4. Water Pump

SI No.	Item	Nos	Power(W)	Total Power (W)	Per Day Usage(hrs/d)	Total energy Consumption per day(Wh/d)
1	Light	1	20	20	6	120
2	Aerator	4	3	12	6	72
3	Filter Pump	1	140	140	6	840
				172		1032

PV Sizing Calculation:

Watt hour per day (Wh/day) required from PV modules = 1.3 x Total energy consumption per day
 = 1.3 x 1032= 1341 Wh/d

Total Watt-Peak rating needed for PV is calculated by dividing Watt hour per day (Wh/day) required from PV modules by Average Peak Sun hours per day of the area

For Bengaluru, it is 6 hours 30 Minutes

Therefore,

Total Watt-Peak rating needed for PV = $1341/6.5 = 206 \text{ Wp}$

As an example, we are going to design the system with below solar panel

1.Loom Solar Panel 225 watt / 12 volt Mono Perc

PV Specification	
Rated Power	225 W
Open Circuit Voltage V_{OC}	25V
Short Circuit Current I_{SC}	11.45A
Voltage at max power V_{mp}	21V
Current at max power I_{mpp}	10.72A

No of Panels required= Total Watt-Peak rating needed for PV/Watt-Peak rating of the panel available
= $206/225=0.91$ modules

Actual requirement=1 module

So this system should be powered by 1 modules of 225 Wp PV module

Note:

While selecting Solar Panels, following criteria should be met to meet Alloy Charge Smart MPPT specs:

- 1) Max open circuit voltage of panel $V_{oc} \leq 90V$
- 2) V_{mpp} of Panel $> V_{Batt_Max} + 3V$

Inverter Sizing:

Input rating of the inverter should never be lower than the total watt of loads.
Also, inverter must have the same nominal voltage as your battery.

For safety, inverter power should be considered 25-30% bigger

Inverter Power= $1.3 \times 172 = 224W$ or greater

Battery Sizing:

Equation for calculating battery capacity is as follows:

$$\text{Battery Capacity(Ah)} = \frac{\text{Total energy consumption per day} \times \text{No of days of backup}}{0.85 \times \text{Depth of Discharge} \times \text{nominal battery voltage}}$$

Where,

0.85 - loss in battery

For 12 hours backup,

$$\text{Battery Capacity(Ah)} = \frac{1032 \times 0.5}{0.85 \times 0.6 \times 12} = 84Ah$$

Alloy Charge Smart MPPT Charger Specification:

Maximum PV open circuit voltage = 90V

Maximum Charging Current output = 20A

For 12V system,

Maximum Power Output of charger = $12 \times 20 = 240W$

No of Chargers required = Total Load/ Maximum Power Output of charger
 $= 172/240 = 0.71$

Actual No of Charger = 1 Charger

Update: Grid as an auxiliary power for solar powered fish pond

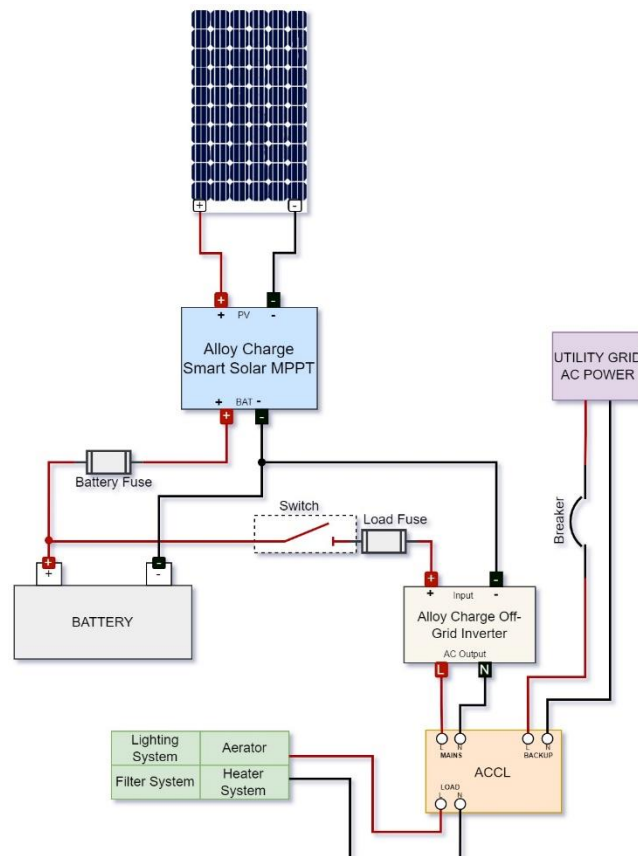
In the event of battery failure or complete discharge, maintaining a stable power supply for your fish pond becomes critical to safeguard aquatic life. Alloy Charge offers a solution that seamlessly integrates solar power with grid backup. Let's explore the necessary modifications:

1. Grid Backup Integration:

- When the battery is unable to provide power, the system automatically switches to the utility grid.
- This ensures uninterrupted energy supply, preventing any adverse impact on your fish and aquatic ecosystem.

By combining solar energy with grid backup, Alloy Charge's solution ensures the well-being of your underwater companions, even during challenging conditions.

Block Diagram:



Bill of Materials:

SI No	Part No	Description	Quantity	Link
1	Loom Solar Panel 225 watt / 12 volt Mono Perc	Solar Panel	1	Go to Site
2	Alloy Charge Smart Solar MPPT	Charge Controller	1	Go to Site
3	Alloy Charge Off-Grid Inverter	Inverter	1	Go to Site
4	TG800R SUV Battery	Battery(80Ah)	1	Go to Site
5	20 Amp Car Blade Fuse - 2 Pieces Pack	Fuse	2	Go to Site
6	Waterproof Power Socket Small Blade Type inline InLine Fuse Holders	Fuse holder	2	Go to Site
7	HEC L&T Miniature Circuit Breakers Single Pole 20A B-Curve, Cat. Nos. BA10200B	MCB(For breaker and load switch)	1	Go to Site
8	ELMEASURE White, 32A Automatic Changeover with Current Limiter, Single Phase ACCL	ACCL	1	Go to Site